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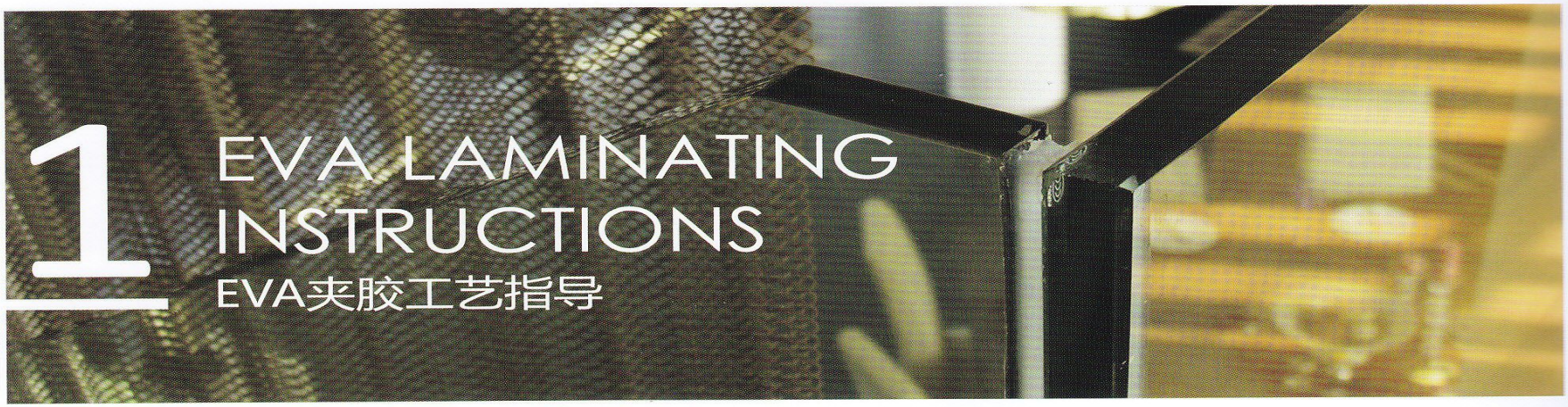
EVA LAMINATED GLASS SOLUTION

GUANGZHOU HUICHI GLASS TECHNICAL CO., LTD

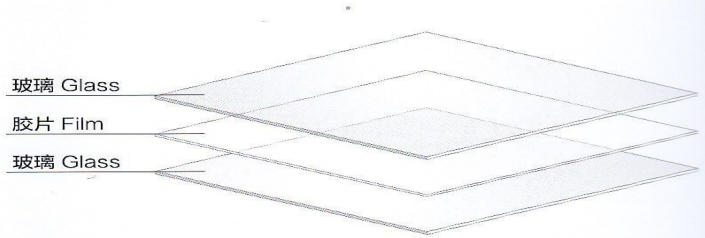


1 EVA LAMINATING INSTRUCTIONS
EVA夹胶工艺指导

01 玻璃材料前期处理及合片
Prepare and overlap glasses

- 将玻璃裁成所需的形状和尺寸，并对边缘进行打磨，防止玻璃碎片的附着引起气泡，还可有效地防止玻璃的边缘割破硅胶袋。
  Choose the right glass, EVA film and fabric.

- 清洁干燥玻璃，EVA胶片及绢丝。用纯净水、去离子水或者溶剂（丙酮、乙醇）清洗好玻璃，再用干燥的净化热空气吹干，表面不要留有污垢、水迹或手印。
  Make sure the glasses , EVA films and/or decorative films is clean, dry, and suitable for laminating.



- 胶片及绢丝裁剪适当大小。
  Cut the EVA film and/or decorative film into right size. The film should be same size as glass, Or may lead to bubble.

- 合好片的玻璃在放入成型架时，玻璃与玻璃之间要留有3~5mm的间隙（即气道）。 为了更好脱气，建议在玻璃四周放置空间架。
  Put overlapped glass into silicon bag and seal. Pls make sure airway unobstructed.

- 检查真空袋是否干净及密封好.如果抽气正常，在常温下维持950mmHG以上真空度至少保持2~5分钟。
  Check the silicon bag is clean and in good condition. Activate vacuum pump and keep vacuum value at -0.095MPA for 2-5mi to double check it is in good condition.

02 加热 Heating

- 将成型架推入加热箱,按照以下参数设定好温度和时间（以下温度是指玻璃表面的实际温度）。特别注意的是不同产品系列,对温度的要求不同。
- 以下温度及时间设置以5mm玻璃+0.38mm 胶片+5mm 玻璃为基础。但是由于各个炉体结构不同、硅胶板的热传导速度不同、玻璃种类大小及厚度不同，以及周围环境温湿度等影响，用户应该根据夹胶时的具体情况做适当调整。

  The following temperature and time setting based on 1Pc 5mm Glass +1Layer film + 1Pc 5mm Glass. The user should do some adjusts according to the process surroundings(temperature and humidity), glass area, glass thickness, glass type and the machine itself. For thicker glass or more layers film, the heat-holding-time should be longer, please consult us.

03 玻璃出炉 Stop vacuum, cooling and take glass out

- 加热并保温完成后，箱内温度降为90度以下时，打开箱门，推出成型架，并立即用风扇均匀降温。

  Open the door and take out of heating bed when the temperature shows 90℃ or below. Suggest using electric fans help to make the glass cold fast.
- 温度降到50度以下，方可停止真空，取出产品。

  Pls do not stop vacuum and take glass out, until the temperature below 50℃.

*为保证最佳透明度，除加工温度须保证外，冷却过程中，冷却速度越快，透明度越好。

The faster temperature cool down, the better the glass transparence is.

01 Reasons and solutions of fog problem
夹胶夹丝玻璃水汽情况原因分析

很多客户做出来的玻璃存在水汽，客户们是这样描述：做出来的玻璃有白雾。

白雾分两种：

- 胶片保温温度或是保温时间不够存在没有融化的现象，但是此种雾度不会很白，这种情况请升高加工温度或延长保温时间。

  Reason : Temperature or heating hold time is not enough;

  Solution: If more layers of glass or eva film, or glass is thicker, The temperature and time should be increased accordingly. Pls make sure the temperature and time is enough.

- 残留水汽的雾颜色很白，就像冬天时对玻璃吹了一口热气产生的白，在玻璃温度较高时，此种白雾不会很明显的表现出来，并且发生此种情况的位置一般在玻璃的边缘。
  水汽情况严重的白雾会伴有一些梅花状的汽泡（如右图）。一般来说，发生此种问题是没有办法解决了，但是用较高温的热吹风吹起雾的地方，可以使症状有所减轻。

如何预防白雾发生呢?

- 保持玻璃表面的干燥。 玻璃在反潮季节时要特别注意保持玻璃表面的干燥。
- 市面上有些清洗机，清洗玻璃后不能使玻璃完全干燥。玻璃用清洗机清洗后，表面残留少量的水份，应把玻璃与玻璃分开晾干后再擦干使用。
- 应用干燥的毛布擦干玻璃 。用酒精擦干净的玻璃后，还应用干燥的棉毛巾在擦一次。
- 延长低温保温时间。 特别是在下雨或较为潮湿的季节，更应要延长低温保温时间。

  Reason : Glass or EVA is damp, or the air is high humidity. In this case, the fog is very white,and alway observed at the edge of glass just when the glass cool down.

  Solution: 1) Make sure the glass, EVA film and fabric dry, especially after glass washing.

  2) Increase the heat-holding time in high humidity season.

02 Reasons and solutions of degumming
脱胶情况原因及分析

做好的夹胶玻璃，放置一段时间后脱胶。
The laminated glass is degumming after placed in room for a few days.

胶片没有真正的发挥粘性，加工时用的温度低，保温时间短。 升高保温温度，延长保温时间就可以解决这种问题，如右图情况：

Reason: 1) Temperature or heat-holding time is not high enough, so that the adhesion is not good.
2) EVA film damp seriously
3) EVA film is out of expiration.

Solution: 1) If more layers of glass or eva film, or glass is thicker, The temperature and time Should be increased accordingly. Pls make sure the temperature and time is enough.
2) Pls confirm the EVA film is in good condition.

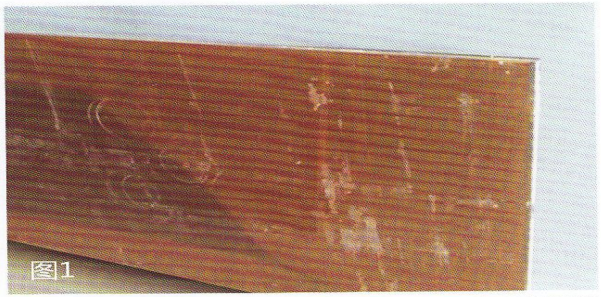


图1

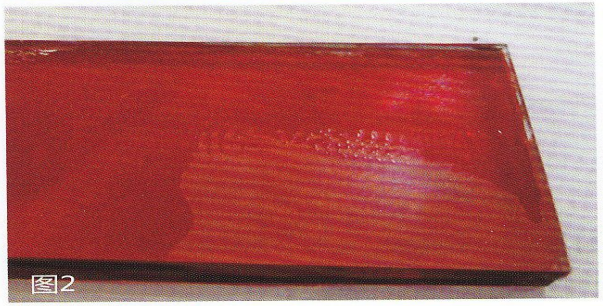


图2

玻璃不粘胶片
Glasses can not stick together

1．玻璃表面是否清洗干净，玻璃表面有油脂或水分较重（较重的水分会影响胶片对玻璃的粘性）。
2．工人手上的汗水和油脂粘附到了玻璃表面（特别是夏天）
3．检查是不是温度过低，加高温度和加长保温时间看问题是否能解决。
4．以前的玻璃在运输过程中会用纸隔开，为了节约成本，一部分厂家会在玻璃表面喷洒化学助剂取代隔纸。这种情况下需用稀酸清洗玻璃再进行测试。
5．客户自己无法解决，可发样品来我司进行测试 。

Reason: Glass surface has grease, too much water, or other adhesion-resist substance.

Solution: Clean and dry glass carefully.

夹胶夹丝玻璃磨边后进水
Glass is degumming after edge-grinding.

夹胶夹丝玻璃磨边后进水导致脱胶，这种情况的发生也是由于胶片未能完全发挥粘性，升高加工温度和延长保温时间可以解决问题。

Reason: 1) The adhesion is not good, so that water penetrated into glass from the edges during process of grinding.
2) The eva film melt because of high temperature when grinding. So that water penetrated into glass.

Solution: 1)Increase the temperature and time during laminating so that the adhesion reach the best.
2) Release the grinding wheel and put more water into the tank to make the glass temperature lower.

夹胶夹丝玻璃在没有安装前是好的，但是安装后玻璃边缘产生了脱胶情况。
Glass is degumming after installed.

安装时打了玻璃胶（如图3）

胶片与玻璃胶产生反应的现象：

（1）早期或者情况较为轻微时，离玻璃边缘一公分距离处有较小的气泡产生。

（2）随着时间推移，反应加剧，产生树枝状的脱胶情况（如图1、2）。

（3）较为严重的脱胶情况，会产生像树枝状条纹或经脉状的花纹。

打玻璃胶需要注意的事项：

（1）在做超白、深白、磨砂白以及彩色时建议客户打中性快干型的玻璃胶，建议使用东芝381玻璃胶。

（2）客户选择玻璃胶时，最好自己先对玻璃胶进行测试。

（3）夹胶玻璃的边缘打上封边剂，等封边剂凝固后在进行打玻璃胶，可以十分有效地预防玻璃胶导致的脱胶。

Reason: Silicon glue or sealant which was used into install has reaction with EVA film and it lead to degumming.

Solution: 1) Please fully confirm the corrosive and permeability of the sealant and glass glue before using. Make a small sample test will be better.
2) Recommend EN edge sealing reagent before use the silicon glue.
3) For the color and indoor EVA film, neutral fast cured silicon glue is recommend,like Toshiba -381.

白色、彩色系列的胶片粘附性不如高透普透强，而且彩色系列随着时间的延长粘性会有所减小。建议在加工在两边加上0.1、0.12或0.15的普通胶片。
Suggest use one more layer of transparent film at each side of color film to enhance the adhesion of color film.


图3

03 Reasons and solutions of bubble problem
夹胶夹丝玻璃气泡的原因分析

气泡是在夹胶夹丝玻璃中最常见的问题，气泡的分布、形状等的不同决定解决的方式不同。

夹胶玻璃边缘有气泡
Bubbles on the edges of laminated glass

在硅胶袋打开后，玻璃的温度还较高，在取出玻璃的过程中，胶片处于熔化状态，这种状态在硅胶袋里有压力的情况下不会反弹，硅胶袋一旦打开胶片失去压力弹回玻璃，即气泡发生倒吸现象（在夹丝玻璃加工过程中较为明显）。**这种情况请不要过早停止真空泵，待温度自然下降后，再停止真空泵，打开硅胶袋，取出玻璃。**

Reason: Stop vacuum pump too early.

Solution: Pls don't stop vacuum pump until glass temperature down to 50℃.

夹胶玻璃有整片的小气泡（如图1）
Small bubbles irregularly in whole glass surface .

真空泵没有抽到真空或是真空值没有达到-0.095MPa。

1、检查是否有漏气，真空抽气管道是否有破损的情况。

2、确认硅胶袋内的玻璃摆放合理，硅胶袋成功抽真空可以很明显地观察到，硅胶袋整体变硬，玻璃形状突出。

3、检查"气道"是否堵住，玻璃的四周可以放些丝网或用干燥的木条把玻璃（最好用抽空网）和气孔处链接，确认玻璃和汽孔处联在一起。

4、检查真空泵的大小，是否需要换油保养等。

Reason: Vacuum extracting is not good.

Solution: Check silicon bag is leaking , blocked or underpower; pls replace the silicon bag, or put some wire mesh or dry wooden sticks to connect the glass and air vent to make sure the air can be exhausted completely.

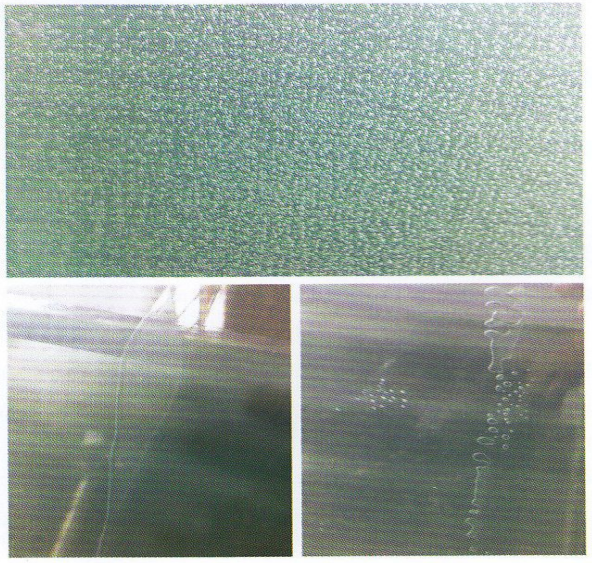


图1

玻璃做出来冷却后都是好的，但是磨边后就破裂或出现气泡。
Glass is broken or bubbles after edge grinding.

此种原因相对来说比较少，夹胶夹丝玻璃磨边时，会产生大量的热能。请在磨边时把磨轮调松一点,加大冲水量,让其充分冷却,避免打磨时产生过高温度导致大量的热能不能及时的释放造成玻璃破裂和出现气泡。

Reason: During process of grinding, the glass temperature is too high but can not released in time.

Solution: Pls turn the grinding wheel loose and put more water into the tank to make the temperature of glass lower.

夹胶玻璃有长条状的气泡（如图2）
Bubble is long.

钢化玻璃夹胶最常见的气泡成一条条长形分布，原因是钢化玻璃表面不平整，胶片的厚度不足不能够填补玻璃弯曲造成的空隙，在弯曲处就形成了长形的气泡。

1、增加胶片的厚度

2、要求钢化厂家进行配对烧钢化.

Reason: The plainness of the glass is poor (especially the tempered glass).

Solution: 1) Make sure the inserted film is thicker enough to fill up the deformation scale of thetwo overlapping glasses. 2) Change tempered glass. Or choose the matched tempered glass

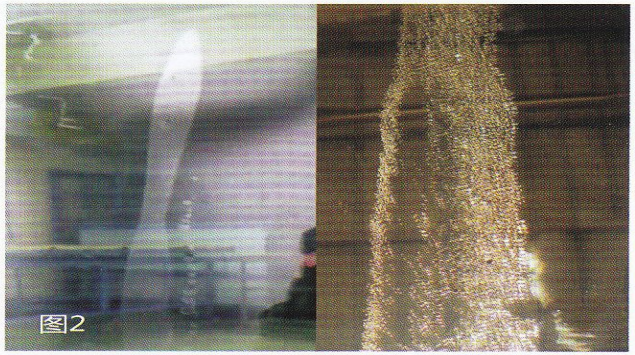


图2

图3

夹胶钢化玻璃在打孔处常有气泡（如图3）
Bubbles around the hole.

在钢化玻璃钢化的过程中，打孔处往往不平整。所以一般打孔的玻璃比不打孔的玻璃平整度要差，在选择打孔的钢化玻璃时请特别注意打孔处的平整度。

请把两边孔位用高温胶布贴紧密封或适当增加中间膜厚度。

Reason: The plainness around the hole is not good.

Solution: Pls seal the hole using the heat-resistant tape on both sides of it.

04 Reasons and solutions of self-explosion
夹胶夹丝玻璃的自爆原因分析

自爆过程有以下三种：

1、当我们打开硅胶袋时，玻璃在硅胶袋内已经破裂。
Glass is broken during process of laminating.

（1）玻璃本身的质地不好很易碎（如玻璃存在大量杂质），请更换一批玻璃；压花玻璃等工艺玻璃也易碎.

Reason : Glass is not of good quality, especially for pattern glass.

Solution: Pls change glass.


图1

（2）硅胶袋内有玻璃碴或其它较硬物体的存在，在真空泵抽空的压力下玻璃被压碎，需要清理硅胶袋

Reason : There are glass shatters or hard objects in the silicon bag.

Solution: Pls clean the silicon bag carefully.

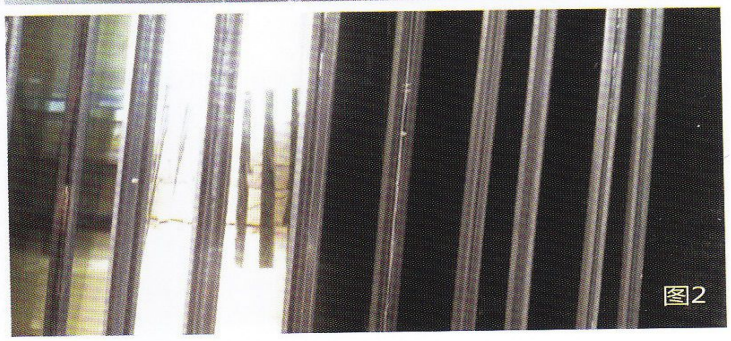


图2

2、玻璃从硅胶袋内拿出来是好的，但是过了一小会儿就破裂了。
Glass is okay when taking it out of furnace, but after hours, glass is broken.

当我们打开硅胶袋时，外界的温度较低，但是玻璃表面的玻璃较高，这样高温度的玻璃遇到冷的空气产生“热胀冷缩”而自爆。加工普通玻璃时较易发生此现象，钢化玻璃较少。可以等待玻璃在硅胶袋中自然降温再行取出，注意降温过程中不要停止抽真空，以免吸入空气形成气泡.　玻璃出炉后散热不均匀，也容易产生自爆。普通玻璃在出炉后，玻璃与玻璃之间需要隔开（如图2），切忌玻璃层叠，让玻璃表面均匀的降温，防止玻璃因降温不均匀而自爆。

Reason : Taking glass out too early. glass went cold suddenly.

Solution: Pls stop vacuum and take glass out when the temperature cool down to about 50° C. And also cool down gradually and avoid water.

3、玻璃从硅胶袋内拿出来是好的，但是过了几天甚至过了一个月才破裂。
Glass is broken after taking out of furnace for a few days.

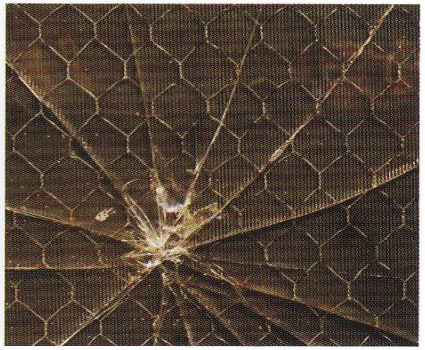
玻璃存在内应力不均匀：玻璃边缘溢胶多，边缘玻璃较薄，整个板面的玻璃应力不均，玻璃被拉成了一个弯形。玻璃要弹回去，但是受到胶片的拉力，这样就产生了破裂。

这种情况应使用溢胶量小的胶片(如我司的PVS-H和 PVS-B 系列胶片），或在加工过程中通过适当降低温度，延长保温时间的办法来减少溢胶，在加工过程中在玻璃的边缘放置干燥的木条，减小玻璃边缘的压力以达到减少溢胶的目的。

Reason： Due to EVA film flowing out too much at the edges, the glass slightly bent. It tend to break because of self-stress if the temperature suddenly cool down.

Solution: 1) Pls try placing dry wooden sticks around the glass to reduce the pressure;
2) Choose the low flow EVA film like our **PVS-H or PVS-B.**

图3



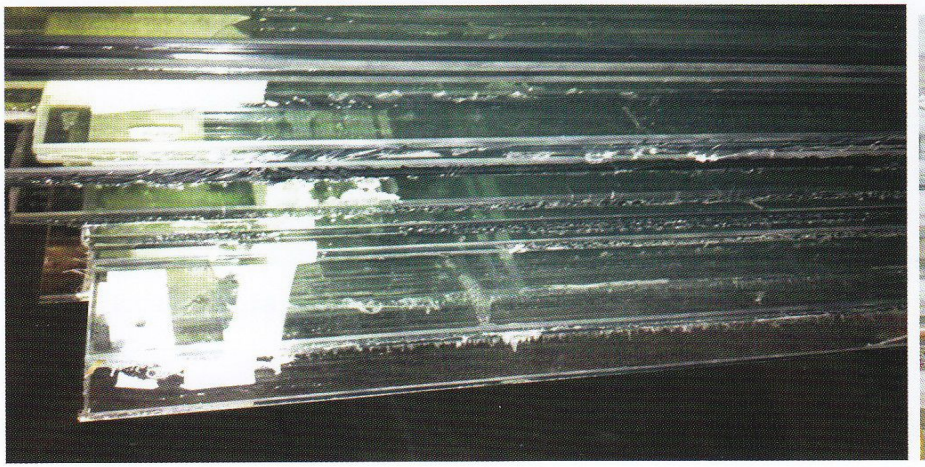
05 Reasons and solutions of EVA film flowing out

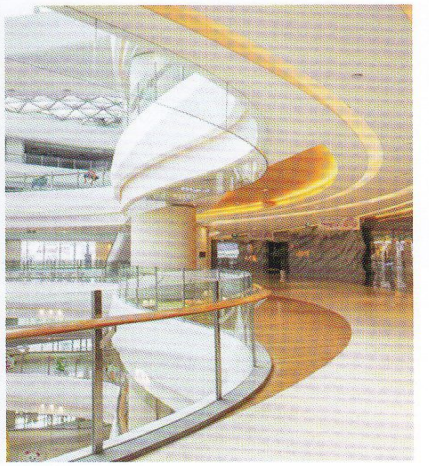
夹胶玻璃溢胶情况原因及解决

夹胶玻璃溢胶是客户在加工过程中遇到的最为头痛的问题之一。

玻璃的边缘溢胶难以清理，溢出的胶又会粘附在硅胶袋的表面，粘在硅胶表面的胶又会粘在玻璃的表面，这样就更加的难以清理. 对于透明夹胶玻璃来说只要清理干净就完事了，最起码可以交货。但是彩色玻璃溢胶严重就相当于夹胶失败（如下图）。

For most of customers, it is a headache problem. Too much film flowing out make the glass and even silicon bag become very dirty . It is very difficult to clean up. Especially for color film, too much film flowing out may lead to the glass color become uneven, edge color lighter but middle color deep. In serious case, film flowing out may lead to the glass self-explosion.





解决办法：

1、用溢胶量少的胶片,如我司HC-G或者是PVS-H

2、降低温度延长保温时间（注意：①要首先保障夹胶玻璃的质量，如高透的必需要有高的透明性，这样才可以保障使用在户外。②要对它的粘性进行测试：把玻璃打碎仔细观察碎颗粒边缘是否有脱胶的情况）。

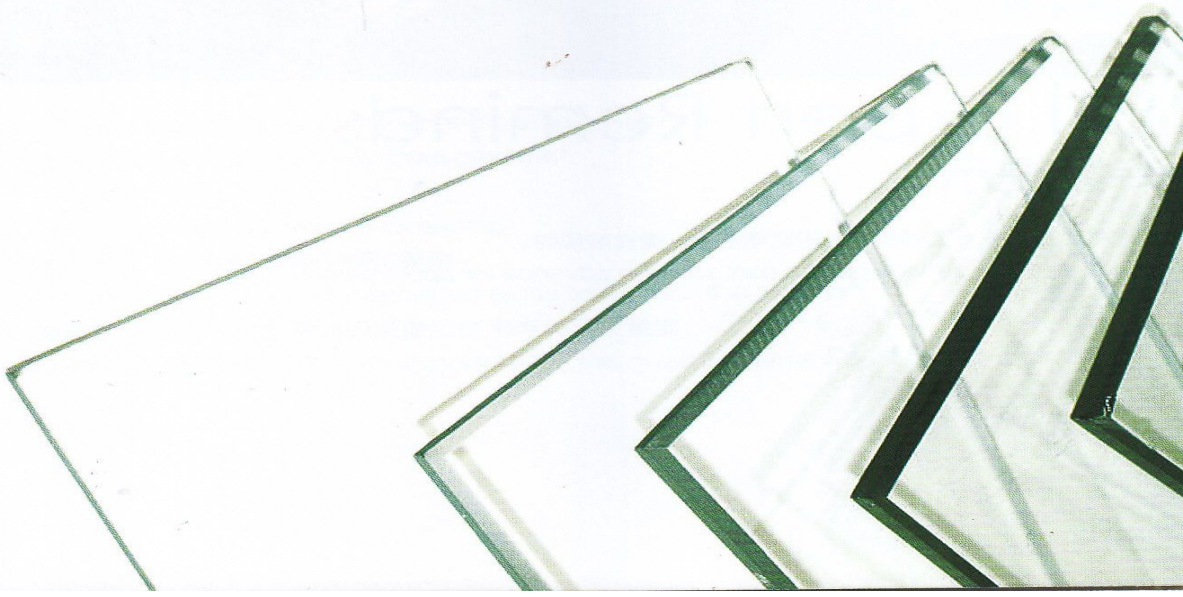
3、对于彩色夹胶我们可以在其边缘放一些干燥的木条以减小玻璃边缘的压力（参照我司“加工工艺指示图”）。

Solution: 1) Choose the low flow EVA film , like our **PVS-H/HC-G.**

2) Pls try to decrease the temperature and increase the heat-holding time to reduce the film coming out. Of course, first of all we need make sure temp and time is enough to get good transparency and adhesion.

3)Put dry wooden sticks around the glass to decrease glass edges pressure.

4) Recommend PET film used to help to reduce the film coming out.



01 我司专家提示 Reminds

1、同样厚度不同结构的夹胶玻璃，其强度取决于最薄层单片玻璃的强度，而不是夹层玻璃的总厚度，如5mm+5mm夹胶玻璃强度>4mm+6mm夹胶玻璃的强度；
Same thickness but different structure laminated glass, the strength depend on the strength of the thinnest layer glass, rather than the thickness of laminated glass, For example 5mm+5mm>4mm+6mm.

2、厚结构夹层玻璃比薄的夹层玻璃要好,多层结构夹层玻璃比双层结构要好；
The thicker, the better. The more layers, the better.

3、半钢化夹层玻璃比普通夹层玻璃和钢化夹层玻璃更经得起冲击；
Heat strengthened laminated glass is better than ordinary float glass and tempered glass.

4、总厚度不变，加大EVA胶片的厚度可增强抗御暴力入侵的能力；
The thicker EVA film is, the better the impact resistance is.

5、防弹防爆玻璃不能使用钢化玻璃基片合成。
Tempered glass is not recommended to make bullet proof laminated glass.

02 我司专家提示 Expert Reminds

1、封边剂、玻璃胶等附属材料在施工使用前一定要充分确认其污损性、浸透性,这些材料中可能含有引起膜与玻璃脱落的材质；
Please fully confirm the corrosive and permeability of the edge sealing reagent and silicon glue before using, for those may lead to films breaking away from glasses!

2、点式结构玻璃需作强化处理；
For point structure glass, should make reinforcement processing.

3、为确保夹层玻璃安全性采光顶玻璃（不上人）最好选择半钢化夹层；
For skylight laminated glass, recommended heat strengthened glass to ensure the safety.

4、玻璃基片的清洗工艺、合片室环境控制和温度对夹层玻璃的质量和使用寿命至关重要。
Glass washing, overlap and heating temperature is very important for the quality of laminated glass.

4

Storage Conditions

EVA储存条件

- 温度Temperature <25℃，湿度Humidity<50%
- 远离火源，积水。 避免阳光直射，不可重压。
  Keep away from the Fire, Sunlight, and Water. Do not press.
- 保质期： 12个月，9个月内用完最佳。
  Shelf life:12months. It would be better if use it within 9months.

5

Notes for use

使用注意事项

1. 封边剂、玻璃胶等附属材料在施工使用前一定要充分确认其污损性、浸透性,这些材料中可能含有引起膜与玻璃脱落的材质。
Please fully confirm the corrosive and permeability of the edge sealing reagent and silicon glue before using, for those may lead to films breaking away from glasses!

2. 玻璃完成夹层后请不要立即进行磨边处理，建议放置24小时以后才进行磨边。否则易造成脱层或者粘附力下降。
Please make edge grinding at least 24 hours later after taking glass out of laminating oven. Or it may lead to degumming, or adhesion falling.